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THE “OUCHLESS” AMBULANCE

OBJECTIVES

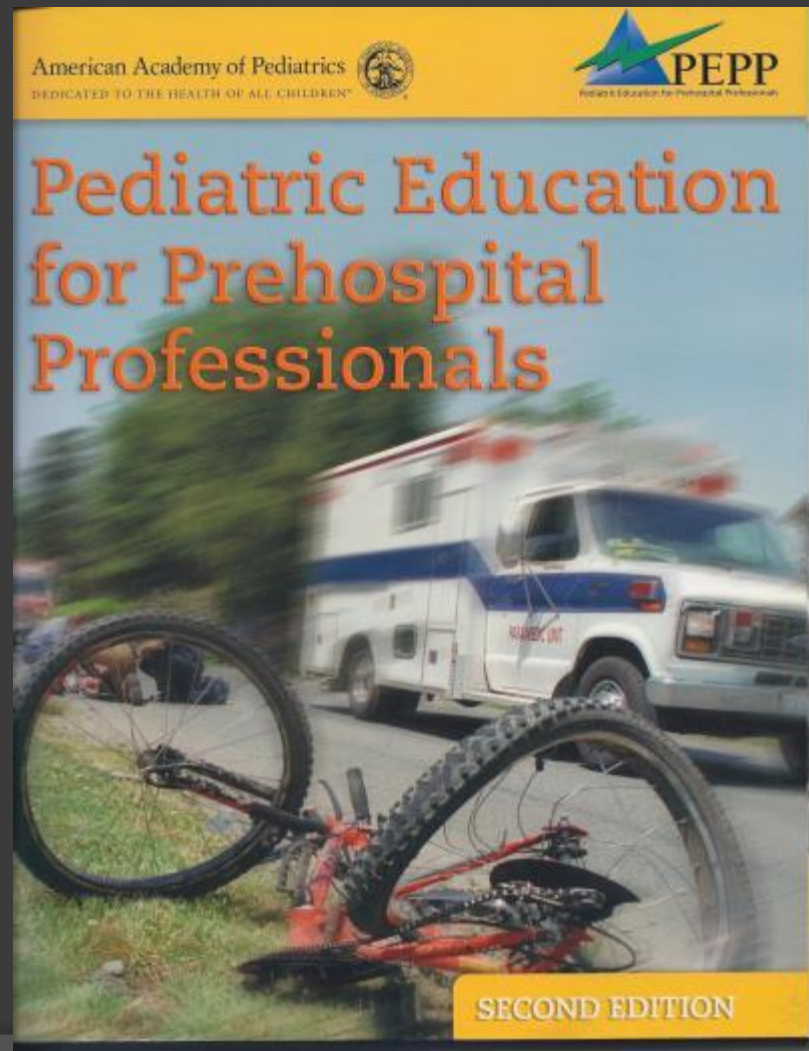
- Understand “oligo-analgesia” in kids
- Discuss barriers to pain management in EMSC
- Describe the pharmacokinetics of intranasal (IN) drug delivery
- Review the efficacy, safety & feasibility of IN fentanyl
- Advocate for statewide implementation of prehospital IN fentanyl for children

CONCLUSION

Intransal fentanyl should be your
first choice for most moderate-severe
pain management in EMSC



DRUG EFFICACY IN EMSC



EMSC EPIDEMIOLOGY

- Pain is one of the commonest presenting complaints among children transported by 911
- Most painful conditions in children are from trauma
- Trauma comprises about 50% of pediatric EMS

OLIGO-ANALGESIA

- Many studies show that children receive less treatment for pain than adults in all settings
- In the field, children with significant injuries (eg, fxs, burns) often do not receive field analgesia (21%)
- Paramedics have significant reluctance to give analgesia, b/o concern for malingering, unclear control target, fear of masking dx, general aversion for opiates

Walsh B et al: Paramedic attitudes regarding prehospital analgesia. Prehosp Emerg Care. 2013 Jan-Mar;17(1):78-87.

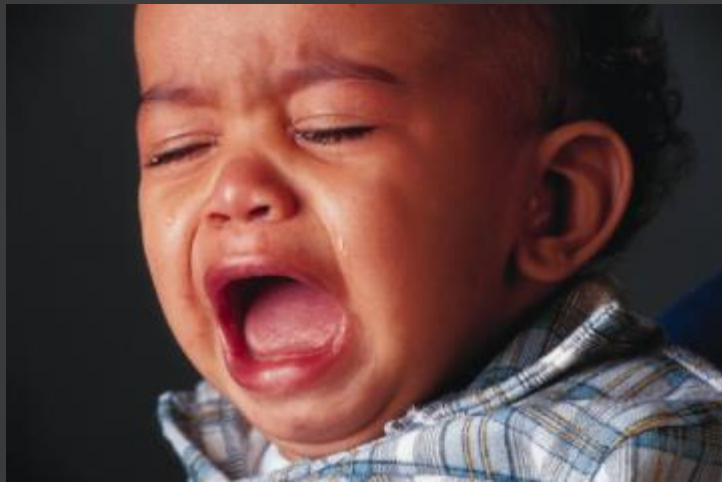
PAIN IN KIDS

- Early pain experiences may play a particularly important role in developing “needle phobia” and shaping an individual's pain responses as an adult
- Untreated early pain **INTENSIFIES** subsequent pain experiences



EARLY PAIN

- There are many myths about analgesia and sedation for injured or anxious infants and children



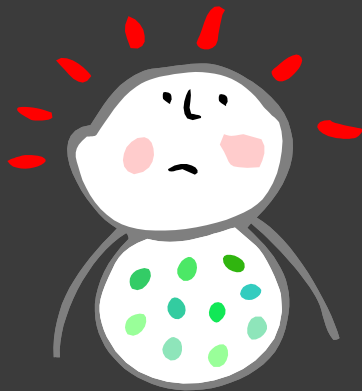
MYTH

He is too little to remember it!



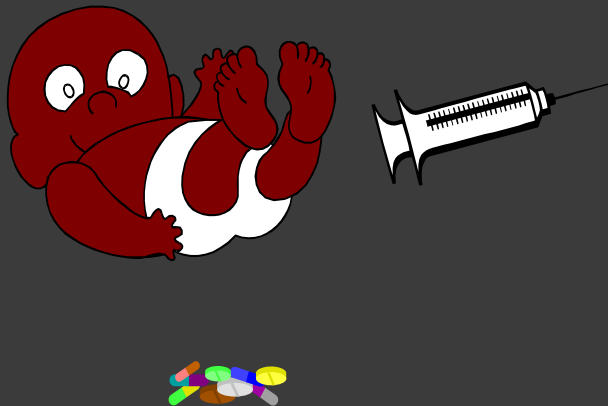
MYTH

These drugs are too dangerous
for children!



MYTH

We are going to addict her narcotics!



MYTH

This will only hurt for a minute!



REALITY

Historically, the agent of choice:

BRUTANE



PREMISE



Pediatric analgesia
should be basic
knowledge for all
prehospital and ED
emergency providers

PROMISE



Once you see and
experience judicious
analgesia in children,
there is never any
going back to
BRUTANE

BARRIERS IN EMSC

- ⦿ Provider anxiety with kids
- ⦿ Unfamiliarity with EMS pain protocol
- ⦿ Insufficient pain training
- ⦿ Need for IV access

Williams DM et al: Barriers to and enablers for prehospital analgesia for pediatric patients. Prehosp Emerg Care. 2012 Oct-Dec;16(4):519-26

PAIN MGT IN FIELD

TIPS to begin 



- Certain kids need special concern
- Prevention is better than treatment
- Involve the child and family in assent/consent, and in field nonpharmacologic support

SUMMARY

- ⦿ Pain is one of the most frequent serious symptoms in EMSC
- ⦿ Paramedics have significant reluctance to administer opiates to children
- ⦿ Children are far more vulnerable to early pain & less likely to receive analgesia in the field and in the ED
- ⦿ Many myths underlie “oligo-analgesia”
- ⦿ Need for IV access is a significant barrier to early treatment of pain

INTRANASAL DRUGS



SCENARIO 1

A 6 year old boy fell off his bicycle at school and injured his arm

- He is in significant pain, 911 called
- Arm is angulated, VS nl



SCENARIO 2

- A 13 y.o. girl sustains severe leg and foot burns from a pan of boiling water knocked off the stove



INTRANASAL (IN) DRUGS

- ⦿ Fast
- ⦿ Effective
- ⦿ Safe to patient and provider
- ⦿ Simple, little training required

IN DRUG ADMINISTRATION

IN drug administration offers an
transformational opportunity to create an
“ouchless” ambulance



IN PHARMACOKINETICS

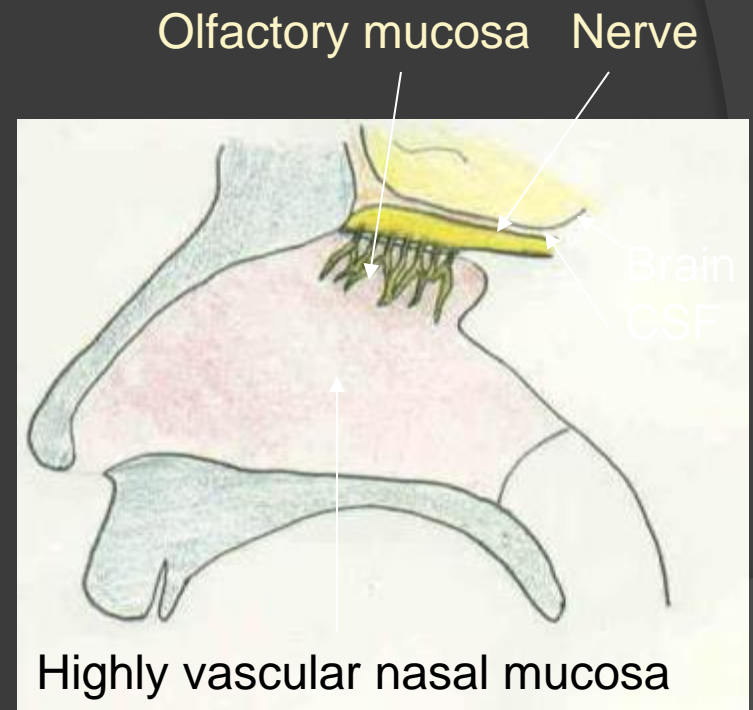
- ⦿ First pass metabolism
- ⦿ Nose-brain drug pathway
- ⦿ Lipophilicity
- ⦿ Bioavailability

FIRST PASS METABOLISM

- Molecules absorbed through the gut, including all oral medications, enter the “portal circulation” and are transported to the liver
- Liver breaks down drug molecules and only a small fraction enter the circulation as active drug
- This process is called “first pass metabolism”
- Nasally delivered medications avoid the gut, so do not undergo first pass metabolism

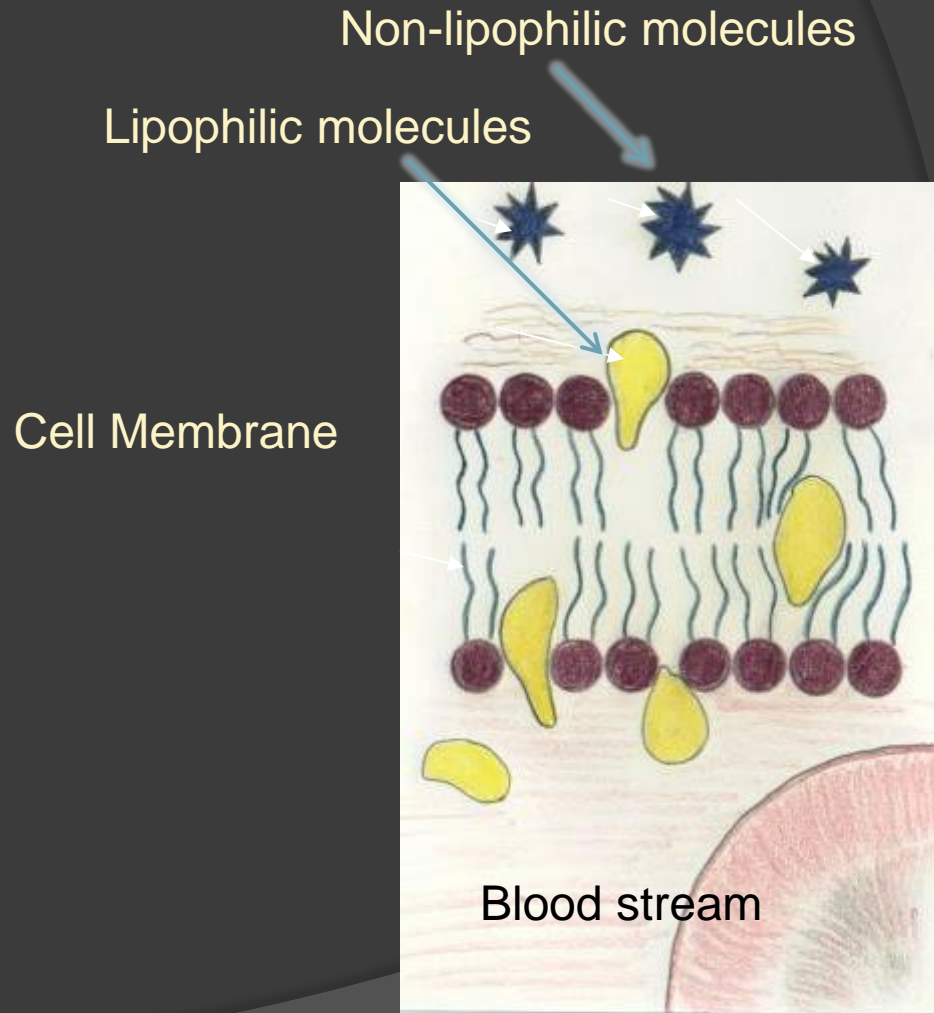
NOSE-BRAIN PATHWAY

- The olfactory mucosa is in direct contact with the brain and CSF
- Medications absorbed across the nose-brain directly enter the CSF and bypass the blood brain barrier
- This is termed the nose-brain pathway and offers a rapid, direct route for drug delivery to the brain



LIPOPHILICITY

- Cellular membranes are composed of layers of lipid material
- Lipophilic drugs (eg, fentanyl), are easily and rapidly absorbed across the nasal mucous membranes



BIOAVAILABILITY

- How much of the drug is delivered to tissue:
 - IV medications are 100% bioavailable
 - Most oral medications are about 5%-10% bioavailable, due to first pass metabolism
 - Nasal medications vary, but approach 90-100%

BIOAVAILABILITY

Volume and concentration

- Too large a volume or too weak a concentration limits absorption, because the drug cannot be absorbed in high enough quantity for efficacy
- Volumes over 1 ml per nostril are too large and may result in runoff out of the nostril

BIOAVAILABILITY

Nasal mucosal characteristics

- Obstruction of the nasal mucosa may limit contact and absorption of medications
 - Examples: Bloody nose, nasal congestion, mucous discharge

ATOMIZER

- Atomizer nebulizes IV drug to appropriate particle size for rapid mucosal absorption



OTHER PREHOSPITAL IN DRUGS

- ◉ Naloxone: equivalent to IV naloxone
- ◉ Midazolam: slightly better than rectal diazepam and equivalent to IM midazolam

FENTANYL

- Synthetic short acting opiate at least 10 times more potent than morphine
 - IN has 89% bioavailability, 7 minute onset and 1 hr duration
 - Dose = 1.5 ug/kg, half in each nostril
- Side effects similar to IV morphine
 - Sedation
 - Respiratory depression
 - Nausea

QUESTIONS

- ⦿ Safety in children < 3 yrs
- ⦿ Frequency of resp depression
 - Need naloxone to administer IN or IM
 - Must have bag-mask device available

PREHOSPITAL IN FENTANYL

Pain control

- No needles, no need for an IV—totally “ouchless”
- Rapid delivery
- As effective as IV morphine in children
- Pain control without need to establish an IV in patients that will not need an IV (minor orthopedic trauma and burns)
- Minimal side effects, no serious complications yet reported

STUDIES OF IN FENTANYL IN EMS

- ◉ Multiple studies in Australia
- ◉ Most recent retrospective study, 2011
 - 3312 patients, 5-15 years
 - Moderate-severe pain
 - IV morphine, IN fentanyl or inhaled methoxyflurane
- ◉ IN fentanyl equivalent to IV morphine



Bendall JC et al: Effectiveness of prehospital morphine, fentanyl, and methoxyflurane in pediatric patients. Prehosp Emerg Care. 2011 Apr-Jun;15(2):158-65

CONCLUSIONS

- ⦿ Prehospital pain management is a common task in EMSC
- ⦿ Better education and training to dispel myths will help remove barriers to field treatment
- ⦿ Nonpharmacologic approaches and clear protocols will facilitate earlier management
- ⦿ IN fentanyl offers our best hope for an “ouchless ambulance”

